Linking Finance and Operations in Retailing

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Introduction

The linkage between operations management and financial performance is not well understood in most supply chains. We used public financial data from a large number of retailers to explore the drivers of differences in, and thereby understand the tradeoffs between, gross margins and other metrics--such as inventory turns and selling, general and administrative expenses. We examine the effect of changes in "management measures" -- such as return on assets, variance in return on assets, and growth rate -- on long-term stock market performance and show how these measures can be used to benchmark performance across industry segments. Our analysis contributes both a better understanding of retail operations and a methodology that can be used to discover similar relationships in other supply chains.

Consider the following questions.

Question 1 Had you invested $1,000 in Wal-Mart ("Wal-Mart") stock at the close of trading on December 31, 1978, it would have grown to $173,000 by the end of December 31, 1997 (adjusted for dividends and splits). A similar amount invested in Gap Inc. ("Gap") would have grown to $136,000 and in Circuit City Stores Inc. ("Circuit City") to $278,000. Had you instead invested indiscriminately in retail stocks in December 1978, roughly 17% of the firms in which you invested would have filed for bankruptcy before December 1997. What explains this wide variation in stock market performance?

Question 2 To what extent can variation in retail stocks be explained by differences in management measures[1] such as sales growth rate, inventory turns, and gross margins? Better stock market performance might be expected to result from better management measures, yet the relationship is in many cases not straightforward. Consider that during the years 1986 to 1995 sales growth for Best Buy Inc. ("Best Buy") was 47% per year and for Tandy Corporation[2] ("Tandy") only 7.5% per year. Yet the ROA during that period was only 11.5% for Best Buy and 20.5% for Tandy. Which company paid higher stock returns?

[1] We use the term "management measures" to denote metrics that managers are often rewarded on. Thus, managers often attempt to control these metrics.
[2] Radio Shack is part of Tandy Corporation.

Question 3 Finally, how do the different management measures relate to one another? Are high turns typically accompanied by low gross margins, for example, or gross margins correlated with SG&A expenses? Can we conclude from the Best Buy-Tandy example that high sales growth is generally associated with lower ROA?

The relationships among management measures are central to deriving suitable benchmarks for assessing corporate performance. If, for example, the grocery chain Kroger Company ("Kroger") had average inventory turns of 14 and Gap average inventory turns of 7 over the past 15 years, might we reasonably conclude that Kroger managed its inventory better than Gap? Or, if Best Buy had inventory turns of 4 and Tandy Corp. inventory turns of 1.8, would Best Buy be the better inventory manager? How are retailers most effectively compared within and across retail industry segments?

As researchers in supply chain management, we are concerned with measures that are affected by supply chain management practices (e.g., demand forecasting, inventory management) related to asset utilization and product availability, namely, sales growth, inventory turns, gross margins, and return on assets. We do not consider measures such as capital structure, which, although important to stock market valuation, are not directly affected by supply chain management practices. Our interest being in how CEOs can influence long-term shareholder value by manipulating variables that are at least partially under their control, we emphasize long-term stock returns (i.e., over a period of nineteen years), over short-term fluctuations in stock price.

Whether the stock market rewards operating performance is a question that has been asked not only in retail, but more broadly. The relationship between long-term stock market performance and management performance has not been systematically studied generally, hence a methodology developed for retailers that can be applied to distributors and manufacturers as well is likely to prove extremely useful.

Characterizing Retailer Performance from 1978 to 1997

We used stock market data drawn from the Compustat and Center for Research in Security Prices (CRSP) databases to identify patterns in retail stock market performance between 1978 and 1997. **Figure 1** plots a histogram of the compounded annualized stock returns of all public-listed retail firms during this period. To ensure that the data would be representative of long-term retailer performance, we included in our analysis only firms that had public data for at least two years. We adjusted all returns for dividends and stock-splits. For firms that had been publicly traded for more than 2 but less than 19 years, we computed returns based on the available data (e.g., we computed for a firm that had been public from 1985 to 1994, we computed returns for that period)

Our analysis revealed that (1) during this period some retail companies' stock prices went up substantially, (2) the retailing sector outperformed the S&P 500, and (3) despite doing well on the stock market, large numbers of retailers went bankrupt.

Wal-Mart, Gap, and Circuit City, as noted earlier, performed extremely well; an investment in these companies made on December 31, 1978 would have increased more than a hundred-fold by December 31, 1997. Circuit City maintained a compound annual growth rate of 34% over this 19-year period. Many other retail stocks also performed well, 47.5% of the companies for which stock market data was available achieving higher annual returns than the S&P 500.

To evaluate the entire retail portfolio relative to the broader market we designed a "retail investment strategy" (details are in **Appendix 1**). Using this strategy, the annualized internal rate of return on the retail portfolio is 21.94%, on the S&P 500 portfolio 11.35%, and on the value-weighted market index portfolio 15.14%.

But the retail portfolio, although it performed better than the broader portfolios during this period, also exhibits a wider disparity between companies compared to the corresponding $1 investments made in the other two portfolios. The highest return for a retail company was more than 75% per year (for a company with two and a half years of data), the lowest -81.6% per year (for a company with two years of data). Only 46% of the retail companies beat the value-weighted market index, even though retail stocks performed substantially better than market indices. Moreover, the stock market success experienced by many retailers notwithstanding, a substantial number of retailers went bankrupt during this period. Of 293 companies that were public between 1978 and 1997, 112 were de-listed and at least 50 went bankrupt.

The mixed fortunes of retail stocks during the 1978-1997 period saw some extraordinarily successful retailers create some of the wealthiest people in the world (e.g., Sam Walton of Wal-Mart), and roughly 17% of retail firms file for bankruptcy.

Characterizing Variations in Operational Measures such as ROA, ROE, Gross Margin, and Inventory Turns

Using data captured in public financial statements, we address a number of questions that are frequently raised about cross-industry and within-industry differences.

- *Sample cross-industry questions*. Are fashion apparel retailers more profitable than grocery retailers? Does consumer electronics grow faster than other retail segments? Do department store chains have lower inventory turns and higher gross margins than other retail segments? Are there systematic differences between various retail industry segments?

- *Sample within-industry questions*. Within the same industry segment, do firms with high gross margins have low inventory turns? Do firms with higher gross margins spend more on selling expenses? Do firms that try to grow rapidly over a short period of time earn lower rates of return on assets? Are some strategies consistently more profitable than others?

Measures that remain stable from one industry to another can be used to benchmark the performance of different firms within an industry segment. We identify tradeoffs among the different components that constitute these measures.

Figure 2 presents a simplified view of an income statement and balance sheet that emphasize the principal variables of interest in this paper. We compute from these income statement and balance sheet figures return on assets, sales growth, and other management measures (mathematical definitions are provided in **Table 1**).

Results presented in this section are for the five-year period 1994-1998. By restricting our analysis to these five years, we were able to obtain a larger number of firms with complete history of data. Relatively few firms were public during the 1978-1998, the entire period for which we obtained data.

ROA, sales growth, ROE, and financial leverage do not vary across segments

We find that return on assets, sales growth, return on equity, and financial leverage do not vary systematically from one industry to another. Using the analysis of variance (ANOVA) approach to discern industry differences, we classify companies into various segments (e.g., consumer electronics, apparel, and supermarkets) and evaluate the statistical significance of differences in performance measures by comparing the differences *between* segments with the differences *within* each segment. For example, we would conclude that sales growth rates for apparel retailers were much higher than sales growth rates for supermarkets if the difference in growth rates *between* the apparel and supermarket segments was substantially higher than the variation in growth rates among the companies *within* each segment. Details of the ANOVA approach can be found in a statistics textbook.[3]

We fail to find systematic differences in sales growth, ROA, ROE, financial leverage, and stock market returns from one segment to another. In other words, sales growth, ROA, and ROE are similar in the different retail sectors from 1978 to 1997, suggesting that retailers in different industry segments were able to achieve comparable levels of profitability as measured by both ROA and by ROE. Moreover, we find that they had similar financial leverage ratios. **Table 2** presents statistical results that test the hypothesis that a particular performance variable varies from one industry to another. **Table 3** presents average values for some of the variables for each industry segment. The F-values in **Table 2**, for the effect of industry on sales growth, ROA, ROE, and stock market returns , are not significant. It is not surprising that ROA or ROE would

[3] For example, *Business Statistics: Decision Making with Data*, Richard Johnson and Dean W. Wichern, John Wiley and Sons, Inc., 1997.

not vary from one retail segment to another. Assuming limited entry and exit barriers, segments with higher ROE would attract competitors until returns were equalized, segments with low ROE see some companies exit, leaving the remaining companies with higher ROE. Inasmuch as financial leverage is found not to differ significantly among retail segments, our argument transfers to ROA as well.

Although aggregate measures such as ROA, ROE, and sales growth do not vary significantly between retail segments, the components of return on assets do vary between and within industry segments. **Table 3** presents average values for a variety of measures including gross margins, SGA expenses, GMROI, and inventory turns. Retailers with stable, predictable demand and long product lifecycles, such as grocery, drugs, and convenience stores, have better "efficiency ratios" (asset turns and inventory turns) than other retailers. On the other hand, retailers of short lifecycle products such as apparel, shoes, electronics, jewelry, toys, and so forth, tend to have higher gross margins and lower efficiency ratios than other retailers. PC retailers such as CompUSA are exceptions, having low gross margins and high turns while selling short lifecycle products.

Gross margins, inventory turns, and SG&A expenses vary within and between segments

We examine the relationship between the two components of ROE first in terms of the relationship between gross margin and inventory turns, and then in terms of the relationship between SG&A and gross margins. Intuitively, we would expect relationships between some of these component metrics.

The following equation specifies the various components of ROE.

ROE = [(Gross Profit-SGA)/Equity]
= [Gross Profit/Inventory]* [Inventory/Assets]*
[Assets/Equity]*[(Gross Profit-SGA)/Gross Profit]

= [GMROII]*[Assets/Equity]*[Inventory Intensity]*[SGA Intensity]

Anticipating roughly similar ROE measures for different retailers, all else remaining equal, a change in any of the component metrics on the right side of the foregoing equation would be expected to result in a compensating change in some other component metric. For example, a retailer with higher gross margins would experience a compensating change in some other component (e.g., inventory intensity) in order to yield an ROE similar to other retailers. We used our public financial data to evaluate two compensating relationships that can be hypothesized on the basis of the foregoing equation.

Gross margin and inventory turns

We would intuitively expect gross margin and inventory turns to be inversely related, that is, retailers with higher gross margins to achieve lower inventory turns. A retailer that carries a unit of product longer before selling it (i.e., a retailer with slower inventory turns) would expect to earn substantially more on its inventory investment than a retailer that carries the inventory item for a shorter period. For example, Tandy, a retailer that turns its inventory less than twice a year, should realize higher gross margins on each sale than a retailer such as CompUSA, which turns its inventory more than eight times per year. Retailers such as Tandy are said to be following the "profit path" (i.e., earning high profit with each sale), retailers such as CompUSA the "turnover path" (i.e., earning small profits with each sale, doing so quickly after making an inventory investment).

Figure 3 plots the relationship between gross margin and inventory turns for consumer electronics retailers and suggests a logarithmic model. Hence, we conduct regression using the following equation:

$$\log(\text{Inventory Turns}_i) = K_s + b \log(\text{Gross Margins}_i) + \varepsilon_i$$

Table 4 presents the estimation results.

Note that we do not imply causality in this relationship. That is, the model does not imply that if a firm increases its gross margin through better management its inventory turns will decline commensurately. Instead, we propose that the covariance between gross margin and inventory turns is a function of their mutual dependence on the characteristics of a retailer's business.

Gross margin and SG&A expenses

Intuitively, we would expect a retailer with high gross margins to have higher SG&A expenses. The intuition behind this hypothesis can be explained in three ways. One, we would expect a retailer with higher advertising and promotion expenses (components of SG&A expenses) to be able to charge higher prices and, hence, achieve higher gross margins. Two, we would expect ROE to be roughly equal in various retail segments, a relationship that can be generated if increases in gross margins are accompanied by increases in SG&A. Three, we would expect the relationship due to a quirk in retail accounting procedures. Retailers are often classified into two broad categories. One category includes retailers that generate traffic, and hence, spend a considerable amount of money on advertising and promotion. These retailers have high SG&A expenses, but also generate high gross margins. A traditional department store such as Federated or May Company fits this category. The second category includes retailers that locate in high-traffic areas (e.g., mall locations) and incur high real-estate costs. These costs are included in CGS, and hence, reduce gross margin. These retailers typically incur low advertising and promotion expenses because they rely on the mall for traffic. Thus, they have lower SG&A costs. A mall-based retailer such as The Limited fits this category.

Figure 4 plots the results of the empirical test, which demonstrate a strong relationship between gross margin and SG&A expenses. Estimates from the regression are shown in the best-fit equation below the figure. The extremely high R-square of 80% suggests that a substantial portion of the variation in gross margin can be explained by the variation in SG&A expenses.

Inasmuch as different types of retailers are able to achieve similar ROE performance by very different strategies with regard to gross margin, selling expenses, and inventory turns, knowledge of the relationships among these components of ROE can facilitate comparisons across retailers useful to both retailers and investors.

Relating Stock Returns and Operational Measures

We now show that ROA and sales growth have a positive association, and standard deviation of return on assets, s_{ROA}, a negative association, with long-term stock returns. Together, these three variables—ROA, sales growth, and s_{ROA}—explain more than 50% of the variation in stock returns for all the data we have analyzed thus far. We compare this result with the impact of return on equity on stock returns, ROE being a measure of net profitability that is widely used by managers and researchers. Finally, we find that GMROII, like ROA, also has a positive correlation with stock returns, but the extent of association is much lower.

We use the compounded annual stock return realized by a firm's investors over a 10-year period, a measure used by both managers and investors to evaluate how successful a firm has been over a given time period, but we do not adjust the return for the firm's risk profile, even though it is apparent that a 20% stock return achieved by a low risk firm might not be comparable to a 20% stock return achieved by a high risk firm. Details of an approach for adjusting stock market returns for different levels of risk are described in **Appendix 2**.

We test the relationship between stock return and ROA, sales growth, and s_{ROA} by fitting the following linear regression equation to the available data.

$$\mathrm{R_i} = b_0 + b_1\mathrm{ROA_i} + b_2\mathrm{g_i} + b_3(s_{\mathrm{ROA}})_\mathrm{i} + b_4\mathrm{DE_i} + e_\mathrm{i} \qquad \textit{Equation 1}$$

Here R_i denotes average stock returns over some long time period for firm i, ROA_i average return on assets for firm i, g_i its average sales growth rate, DE_i its debt-equity ratio, and $(s_{ROA})_i$ the standard deviation of return on assets. We include debt-equity ratio in order to have a completely specified model since leverage could also be expected to have an effect on stock returns. The error in fitting the equation is e_i.

The best-fit equation obtained from applying the model to all 19 years of data is:

$$\mathrm{R_i} = 10.58 + (0.64 * \mathrm{ROA_i}) + (0.51 * \mathrm{g_i}) - (1.52 * (s_{\mathrm{ROA}})_\mathrm{i}) - (3.19 * \mathrm{DE_i}) + e_\mathrm{i}$$

The resulting R^2 was 0.67. The three management measures considered in the model—ROA, growth rate, and s_{ROA}—thus explain 67% of the variation in stock market returns. **Table 5** shows the tests for statistical significance on each coefficient. Similar analyses using different time intervals with the same underlying data yielded similar results. **Table 5** presents the results of these analyses as well.

Managers have often wondered if their attempts to improve operations are rewarded by Wall Street analysts. Many managers, including some CEOs, have, in private conversations with us, bemoaned the lack of operational savvy among stock market analysts. Moreover, many supply chain and operational improvement ideas, because they involve inter-organization and inter-functional coordination, require the involvement of the CEO and other senior managers. Many middle managers have emphasized to us that this task is difficult because, in the words of one: "My CEO is concerned with stock price, not operational changes."

Supply chain managers can and often do overcome this challenge by estimating the costs and benefits associated with lower inventory levels, fill rate, and so forth in order to quantify the impact of operational changes on a firm's bottom line. We present an alternative approach. Our analysis enables managers to evaluate the impact of operational changes on shareholder wealth. Consider the following example based on data obtained from Best Buy's financial statements. During the years 1985 to 1997 (the years between 1978 and 1997 when the company was public) Best Buy had average gross margins of 16.7% of sales, operating margins of 3.05%, asset turns of 4.06%, average ROA of 12.4%, and annual stock-price appreciation of 22.5%. It also experienced significant problems maintaining product availability at its stores. Noted one analyst: "Over the past three years, the company's [Best Buy's] in-stock percentage on a rolling 12-month basis has never been much above 75%, despite numerous efforts to improve it."[4]

Assume that Best Buy's managers identify process and systems improvement that would boost in-stock availability during each of these years from 75% to 85% without an increase in assets or expenses, a reasonable target for many supply-chain improvement projects. The gross margins associated with additional sales would fall to the bottom-line, increasing ROA from 12.4% to 21.5% and, correspondingly, based on our equation, drive annual stock returns from 22.5% per year to 28.3% per year. [5]

This represents a dramatic shift in stock market valuation; a $1 million investment in 1985 would have appreciated to $11.4 million by 1997 at 22.5% per year and to $19.9 million at 28.3% per year. Even more dramatic, had Best Buy been public during all 19 years a $1 million investment in 1978 would, by 1997, have appreciated to $47 million at 22.5% per year and to $114 million at 28.1% per year.

We also compared the performance of the model presented in equation 3 with two other models. First, using ROE and sales growth rate to explain stock market return, we found that the model we proposed and tested in equation 1 explains as much of the variation in stock returns as

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[4] Salomon Brothers Inc. Investors' Report, June 13, 1996.

[5] From the equation $R_i = 10.58 + (0.64 * ROA_i) + (0.51 * g_i) - (1.52 * (s_{ROA})_i) - (3.19 * DE_i) + e$, we see that if ROA increases from 0.124 to 0.215, then we would expect R_i to increase by 0.64*(0.215 – 0.124) = 0.05824. Thus, R would rise from 22.5% to 28.3%.

do ROE and sales growth. Another model that used GMROII, growth rate, and financial leverage to predict stock market returns performed worse than our current model (i.e., it explained a smaller percentage of the differences in stock market returns), which is not surprising given that GMROII is but one component of return on assets. Good performance by a retailer on GMROII does not imply good operating profitability since the retailer might be incurring disproportionately high selling expenses or have too small an investment in inventory (low inventory to assets ratio).

Finally, we investigated whether our three measures of operating performance—ROA, growth rate, and s_{ROA}—could be used to explain the risk-adjusted stock market return based on the research by Fama and French (summarized in **Appendix 2**). We found that operating performance explained risk-adjusted returns as well as it explained annual stock returns.

Guiding the CEO in Maximizing Shareholder Wealth

Our goal was to educate managers about the relationship between measures they can influence (e.g., ROA and sales growth) and stock market returns. By quantifying these relationships, we offer CEOs a tool for relating their project choices to shareholder wealth. It is surprising that such a tool has only now been developed.

CEOs in retailing, like those in other industries, must constantly allocate monetary and people resources to departments and projects. Projects typically differ along various dimensions (e.g., resources required, expected payoff or impact on various management measures, uncertainty surrounding the payoff, and time elapsed before the payoffs are derived). Decisions about which projects to pursue should be at least partially driven by a project's projected impact on shareholder wealth. Our analysis enables retailers to compare and evaluate different projects by quantifying the impact of changing management measures on stock market valuation. Given the high rate of bankruptcy in retailing, it is understandable that CEOs' project choices are also influenced by bankruptcy risk, a CEO facing a high risk of bankruptcy, for example, would seek investments that have shorter, more certain payoffs.

The analysis presented here needs to be replicated for other industries (e.g., manufacturers and distributors). The issues we addressed in this paper are similar to those faced by senior managers in many industries. The results we present here are unique to retailing, but our methodology applies much more broadly.

Appendix 1

Retail Investment Strategy

This appendix describes an investment strategy that can be used to compare the performance of the retailing sector with broader indices such as the S&P 500.

Assume that an investor invests from December 1978 to December 1997 in three portfolios: a portfolio of retail stocks; an S&P 500 index portfolio; and a value-weighted market index portfolio (where market includes all stocks listed on NYSE, AMEX, and NASDAQ). On December 31, 1978 the investor invests $1 in every public listed retail stock and an equivalent amount in the other two portfolios. For any retail company listed on the stock market after December 1978, the investor buys $1 of stock in the first month of trading and adds $1 to each of the two index portfolios. For any retail company de-listed from the exchange, the investor recuperates all investment in the last month of trading at the current price and simultaneously recuperates the present value of $1 that had been invested in each of the other two portfolios at the time of investing in the de-listed company. At the end of the investment horizon, December 1997, the investor closes the three portfolios and sells all shares. At this time, we compute the internal rates of return of the time-series of cash flows for the three portfolios. These three rates of return can be compared because the investment strategy has been designed to control for the unequal lengths of investment periods in different retail companies.

Appendix 2

Use of the 3-factor Fama and French Model to Compute Risk-adjusted Stock Returns

The risk-adjusted stock return, or "unexpected stock return," is computed using the "3-factor model" proposed by Fama and French. Essentially, this method controls for three non-diversifiable risk factors identified by Fama and French: excess return on the market portfolio; difference between the return on small cap and large cap stocks; and difference between return on high book-to-market and low book-to-market stocks.[6] *The returns not explained by a model containing these three factors are considered as unexpected or risk-adjusted returns.*

Let R_{it} denote the monthly stock return for firm i in month t obtained from CRSP time-series records, R_{mt} denote the value-weighted market return over month t, and R_{ft} denote the risk-free return over month t obtained on 1-month T-bills. According to Fama and French (1993), the expected return on a portfolio in excess of the risk-free rate $[E(R_{it}) - R_{ft}]$ is explained by the sensitivity of its return to three factors: the excess return on a broad market portfolio $(R_{mt} - R_{ft})$; the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks (SMB_t small minus big); and the difference between the return on a portfolio of high-book-to-market stocks and the return on a portfolio of low-book-to-market stocks (HML_t high minus low). Here, the value-weighted market index is based on NYSE, AMEX, and NASDAQ. The portfolios of small stocks, large stocks, high book-to-market stocks and low-book-to-market stocks have been constructed by Fama and French. Thus, the values of SMB_t and HML_t are available from their database. Once we have monthly closing stock prices (adjusted for dividends and splits) for a retailer and monthly time-series values of the three factors over some period, we can estimate this model for the given company using the following regression equation.

$$R_{it} - R_{ft} = \alpha_i + \beta_{i1} (R_{mt} - R_{ft}) + \beta_{i2}\, SMB_t + \beta_{i3}\, HML_t + \varepsilon_{it}$$

If the firm had no abnormal return, the intercept, α_i, in this regression should be zero. Thus, the unexpected or risk-adjusted return for firm i is defined as the intercept α_i obtained from the regression.

[6] Eugene F. Fama and Kenneth R. French, 1993, "Common risk factors in the returns on stocks and bonds," *Journal of Financial Economics*, vol. 33, pp. 3-56.

Figure 1

Histogram of Average Annual Stock Returns of Retail Firms during 1978-1997

(Data: 293 firms that had at least 2 years of stock return history)

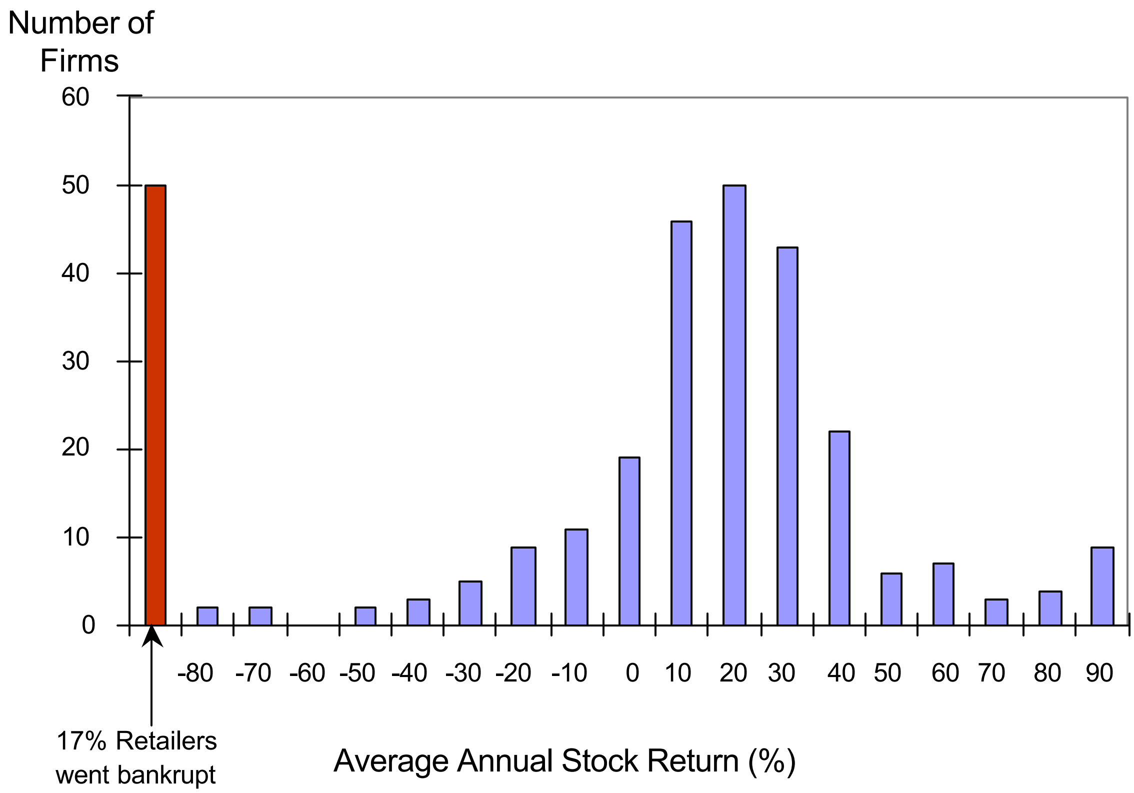


Figure 2

Simplified View of Income Statement and Balance Sheet

(a) Income Statement

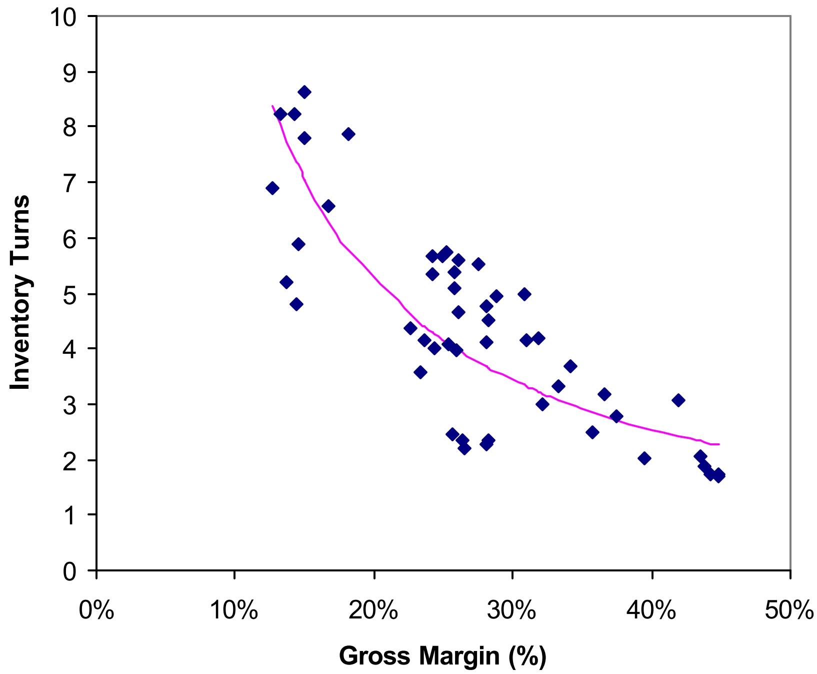
	Notation	*Amount ($)*
Sales (net of markdowns)	S	100
Cost of Goods Sold	CGS	(60)
(includes Occupancy and Distribution Costs)		
Gross Profit		40
Selling, General & Administrative Expenses	SGA	(20)
Operating Profit	EBITDA	20
Depreciation & Amortization Expenses		(5)
Interest Costs		(6)
Profit Before Tax	PBT	9
Taxes		(4)
Net Profit	PAT	5

(b) Balance Sheet

Assets			*Liabilities*		
Fixed Assets	FA	30	Owner's Equity	OE	40
(includes Owned Property and Capitalized Leases)			(includes Retained Earnings)		
Cash		15			
Inventory	Inv	45	Long-term Debt	LTD	20
Accounts Receivable		10	Accounts Payable		40
Total Assets	TA	100	Total Liabilities		100

Figure 3

Plot of Annual Inventory Turns and Gross Margin for all Consumer Electronics Retailers for the Period 1994 to 1998



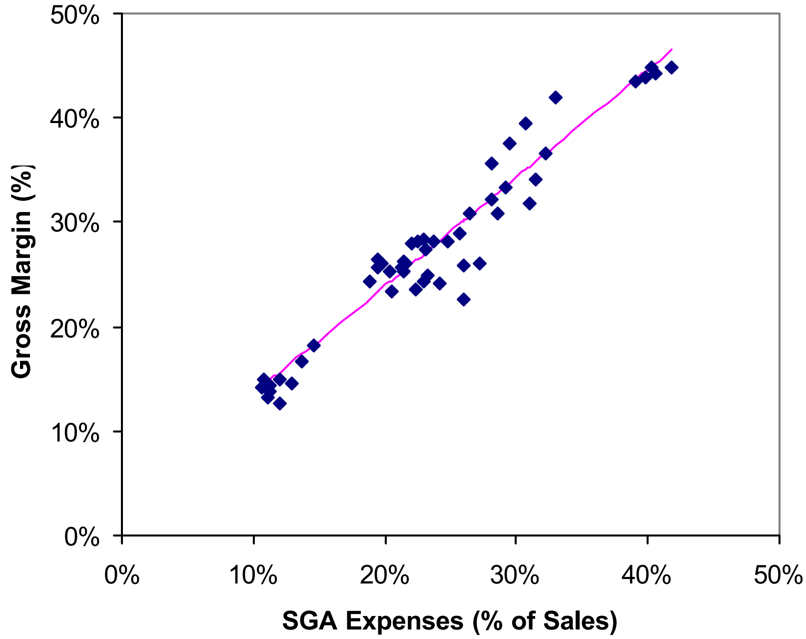
Note: The smooth line shows the fitted equation for the consumer electronics segment,

$$\log IT = -0.016 - 1.038 \log GM.$$

The R^2 for the regression across all segments is 51.82%.

Figure 4

Plot of Annual Gross Margin and SGA Expenses for all Consumer Electronics Retailers for the Period 1994 to 1998



Note: The straight line shows the fitted equation for the consumer electronics segment,

$$GM = 0.032 + 1.036\ SGA$$

The R^2 across all segments is 74.73%.

Table 1

Definition of Accounting Statements-based Performance Measures

Return on Equity (%)		$RoE_t = \frac{PAT_t}{(OE_{t-1} + OE_t)/2}$
Return on Assets	(%)	$RoA_t = \frac{EBITDA_t}{(TA_{t-1} + TA_t)/2}$
Components of Return on Assets:		
Operating Margin	(%)	$OM_t = \frac{EBITDA_t}{S_t}$
Gross Margin	(%)	$GM_t = \frac{\text{Gross Profit}_t}{S_t} = \frac{S_t - CGS_t}{S_t}$
Total Asset Turns	(ratio)	$AT_t = \frac{S_t}{(TA_{t-1} + TA_t)/2}$
Inventory Turns	(ratio)	$IT_t = \frac{S_t}{(Inv_{t-1} + Inv_t)/2}$
Gross Margin Return on Inventory (%)		$GMRoI_t = \frac{S_t - CGS_t}{(Inv_{t-1} + Inv_t)/2} = GM_t \times IT_t$

Break-up of Return on Assets into Component Measures:

$$
\begin{aligned}
RoA_t &= OM_t \times AT_t \\
&= GM_t \times \left(1 - \frac{SGA_t}{Gross\ Profit_t}\right) \times \left(\frac{Inv_{t-1} + Inv_t}{TA_{t-1} + TA_t}\right) \times IT_t \\
&= GMRoI_t \times \left(1 - \frac{SGA_t}{Gross\ Profit_t}\right) \times (\text{Inventory to Assets Ratio})_t
\end{aligned}
$$

"%" implies metric is represented as a percentage (e.g., 53% instead of 0.53).
"Ratio" implies metric is represented as a fraction (e.g., 0.53 instead of 53%).

Table 2

Estimation of Industry Effect on Various Model Variables
Using Two Factor ANOVA Models

$$y_{ist} = a_i + b_s + e_{ist}$$

where i and s are firm and industry segment indices, respectively. The regression has two sets of independent variables: an indicator variable for each firm, and an indicator variable for each industry segment.

Number of industry segments for each model variable: 11

Number of firms: 153

Variable	Across Industry Sum of Squares	Within Industry Sum of Squares	R-Square (%)	F-statistic	p-value
Gross Margin	0.2853	1.2527	18.55	3.2336	0.0009***
SGA Expenses	0.2665	0.9617	21.70	3.9070	0.0001***
Inventory Turns	1015.8270	1951.8770	34.23	7.3902	0.0000***
GMROII	85.2139	233.3579	26.75	5.1853	0.0000***
ROA	0.0805	0.9016	8.20	1.2676	0.2543
ROE	5.7582	59.8222	8.78	1.3668	0.2015
Sales Growth	0.2056	3.5237	5.51	0.8284	0.6020
Stock Returns	0.8842	8.3682	9.56	1.5004	0.1450

*** Significant at the 0.01 level.

Table 3

Average Values of Some of the Variables in the Study for Each Industry Segment

(Time period: 1994-98; Total number of firms: 153)

SIC	Industry Name	Number of Firms	Average Sales ($ million)	Segment Growth (%)	Inventory Turns	Gross Margin (%)	SGA Expenses (%)	GMROII	ROA (%)	ROE (%)
5311	Department Stores	12	5,994.1	11.08	3.38	34.71	28.54	1.13	11.66	17.95
5331	Variety Stores	14	14,186.2	9.35	3.89	27.87	23.18	0.99	13.39	13.17
5400, 5411	Food Stores	26	5,310.0	7.34	9.94	27.94	22.35	2.75	14.99	8.93
5600-5699	Apparel And Accessory Stores	41	1,180.5	8.04	4.27	35.93	27.92	1.47	16.18	11.15
5700	Home Furniture & Equip Store	12	591.5	13.09	4.89	40.81	35.46	2.18	11.64	8.45
5731	Radio,TV, Consumer Electronics Stores	10	2,689.6	12.37	4.38	27.53	23.81	1.07	10.53	6.23
5900	Miscellaneous Retail	6	192.1	0.86	7.04	35.42	24.72	2.15	12.86	10.26
5912	Drug & Proprietary Stores	7	3,379.9	14.77	4.65	28.62	23.51	1.28	8.29	3.67
5944	Jewelry Stores	6	671.3	7.48	1.33	52.65	41.41	0.70	12.56	12.92
5945	Hobby, Toy, And Game Shops	5	2,340.3	6.96	3.11	36.24	31.61	1.12	10.95	3.38
5961	Catalog, Mail-Order Houses	14	703.9	6.93	6.44	36.21	32.42	1.83	9.55	0.03

Table 4: Estimation of the Interrelationship between Inventory Turns and Gross Margin

$$\log IT_{si} = a_s + b_s \log GM_{si} + e_{si}$$

Results of ANOVA (R^2 = 51.82%, F-statistic = 38.05 significant at 0.0001)

Source	Degrees of Freedom	Type III SS	Mean Square	F Value	Pr > F
Segment	10	12.1317	1.2132	5.99	0.0001
logGM*Segment	11	49.4609	4.4964	22.19	0.0001

Parameter Estimates by Retailing Segment

	a_s				b_s			
Parameter	Estimate	Standard Error	t-statistic	p-value	Estimate	Standard Error	t-statistic	p-value
Apparel And Accessory Stores	0.626	0.2303	0.80	0.4251	-0.691	0.1250	-5.53	0.0001
Catalog, Mail-Order Houses	0.643	0.2277	0.88	0.3784	-0.903	0.1066	-8.48	0.0001
Department Stores	0.857	0.2504	1.65	0.0984	-0.293	0.1401	-2.09	0.0372
Drug & Proprietary Stores	-0.449	0.5001	-1.78	0.0750	-1.444	0.3595	-4.02	0.0001
Food Stores	1.621	0.3277	3.60	0.0003	-0.469	0.2063	-2.27	0.0234
Hobby, Toy, And Game Shops	0.403	0.6463	-0.06	0.9513	-0.641	0.5968	-1.07	0.2830
Home Furniture & Equip Store	0.627	0.3775	0.49	0.6242	-0.716	0.3555	-2.01	0.0443
Jewelry Stores	-0.418	0.2674	-3.22	0.0013	-1.046	0.1467	-7.13	0.0001
Miscellaneous Retail	1.219	0.3641	2.13	0.0333	-0.585	0.2430	-2.41	0.0163
Radio, TV, Consumer Electronics Stores	-0.016	0.3173	-1.45	0.1488	-1.038	0.1850	-5.61	0.0001
Variety Stores	0.442	0.1861	2.38	0.0177	-0.636	0.1332	-4.77	0.0001

Table 5

Results of Regression of Stock Returns on ROA, Sales Growth, Sigma ROA and DE Ratio

Time Period		Number of Firms	R-square	Parameter Estimates					Standard Error
				Intercept	ROA	Sales Growth	Sigma ROA	DE Ratio	
19 yrs	1979-97	32	0.67	10.58	0.64[b]	0.51[a]	-1.52[a]	-3.19	5.53
15 yrs	1983-97	35	0.72	-2.17	1.02[a]	0.48[a]	-0.75[c]	3.54	5.09
10 yrs	1979-88	42	0.38	10.12	1.13[a]	-	-1.82[a]	5.99[c]	10.91
	1988-97	59	0.53	-14.51[a]	0.99[a]	0.34[a]	-0.006	4.54[c]	6.68
5 yrs	1979-83	81	0.35	7.23	0.83[a]	0.57[a]	-0.62	3.02	13.42
	1983-87	49	0.53	-12.75	1.45[a]	1.19[a]	1.33	19.64[a]	16.83
	1988-92	69	0.47	-13.99[a]	0.98[a]	0.72[a]	-0.44	-0.85	12.93
	1993-97	93	0.35	-16.91[a]	1.41[a]	0.29[a]	-0.80	4.79[c]	14.22

[a]significant at 99% [b]significant at 98% [c]significant at 95%

Sales growth was not used as an independent variable for 1979-88 because of collinearity with ROA.